
SYSTEMATICS AND BIOLOGY OF THE BEE GENUS *XERALICTUS* (HYMENOPTERA: HALICTIDAE, ROPHITINAE)

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ABSTRACT. Formal justification for the removal of *Xeralictus* from subfamily Halictinae to subfamily Rophitinae is presented. The genus *Xeralictus*, as both adults and larvae, is described and a key separates the two known species, *X. timberlakei* Cockerell and *X. bicuspidariae* new species. Important taxonomic features of the two *Xeralictus* species are illustrated.

The genus is limited primarily to desert regions of southern California and adjacent Nevada, Arizona, and Baja California. Its two species are oligolectic on the loasaceous plant genera *Mentzelia* and, to a lesser extent, *Euclide*. *Xeralictus* species are part of a pollinator guild that includes *Megandrena mentzeliae* Zavortink (Andrenidae) and two species of *Hesperapis* (Melittidae); other bees associated with these flowers, especially those of the andrenid genus *Perdita*, appear to be scavengers that probably are not effective pollinators. The relationships of these bees and flowers are briefly discussed.

INTRODUCTION

Xeralictus Cockerell, 1927, is a genus of halictid bees known primarily from rocky canyons in the deserts of the southwestern United States and adjacent Mexico. The two known species, one previously undescribed, are part of a pollinator guild centered around the loasaceous genus *Mentzelia*. Other bees in this guild include *Hesperapis*, subgenus *Xeralictoides* (Melittidae) and *Megandrena*, and subgenus *Eyrthrandrena* (Andrenidae), as well as several species of smaller bees that appear to be principally scavengers.

Although *Xeralictus* had previously been placed in the subfamily Halictinae (Cockerell, 1927; Michener, 1944), it was removed to the Dufoureae (now Rophitinae) by Eickwort (1969), on the strength of our statements to him at that time. The present paper provides the formal justification for that decision.

SPECIMENS EXAMINED

Material utilized in this study is from the following institutional and private collections: American Museum of Natural History (AMNH); Bee Biology and Systematics Laboratory, USDA, Logan, Utah (BBSL);

California Academy of Sciences (CAS); Museum of Comparative Zoology (MCZ); Central Texas Entomological Institute (CTMI); Natural History Museum of Los Angeles County (LACM); National Museum of Natural History (USNM); Gerald I. Stage, personal collection (GISC); University of California at Berkeley (UCB), Davis (UCD), and Riverside (UCR); University of Kansas (UKAN); and Thomas J. Zavortink, personal collection (TJZC).

TERMINOLOGY

In general, the morphological terminology employed here follows that established by Michener (1944) and most subsequent authors. Puncture sizes and the distances between punctures are as defined by Snelling (1985). Distinction is here made between true *abdominal* segments (numbered in roman numerals in the larval description) and *metasomal* segments (numbered in arabic numerals in the adult descriptions).

Anterior ocellus diameter (OD) is the transverse diameter of the anterior (median) ocellus.

Facial length (FL) is measured with the head in frontal view, along the midline from the apical clypeal margin to the anterior (median) ocellus.

Head length (HL) is measured with the head in frontal view, from the apical (lower) margin of the clypeus to the vertexal (upper) margin of the head.

Head width (HW) is the greatest width of the entire head, including the eyes, in frontal view.

Interocellar distance (IOD) is the minimum distance between the posterior (lateral) ocelli.

Lower interocular distance (LID) is the distance

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between the inner eye margins at the level of the lateral angle of the clypeus.

Ocellocular distance (OOD) is measured as the least distance between a lateral ocellus and the adjacent compound eye.

Ocellovertexal distance (OVD) is measured with the apical clypeal margin and dorsal vertexal margin on the same plane; OVD is the shortest distance between the posterior (upper) margin of the posterior ocelli and the vertexal margin.

Upper interocular distance (UID) is the minimum distance between the inner eye margins (at about level of ocelli).

SPECIMEN DATA

Because published data on the distribution, seasonality, and floral preferences of *Xeralictus* are virtually nonexistent, we have cited full label data for all specimens we have seen.

SYSTEMATICS

When Cockerell (1927) described and named *Xeralictus*, he allied it with genera now included within the subfamily Halictinae. Michener (1944) also placed *Xeralictus* in that subfamily but noted some anomalies in that assignment. *Xeralictus* remained within the Halictinae until Eickwort (1969) removed it to the Dufoureae (now Rophitinae) on the strength of data that we had provided to him.

Michener (1944) correctly observed that in *Xeralictus* females the prepygidial fimbria is not divided (divided in Halictinae), the labrum does not bear an apical process (present in Halictinae), and the scopa is confined to the metatibia and metabasitarsus (scopa includes metafemur in Halictinae). These three features, anomalous within the Halictinae, are common within the Rophitinae. More recently, Michener *et al.* (1994) stated that placement of *Xeralictus* in the Rophitinae is tentative but presented no reasons why inclusion therein should be so considered. In our view, the assignment of *Xeralictus* to the Rophitinae is fully justified for reasons presented below.

Xeralictus shows obvious affinities with the Rophitinae and shares those features of the Rophitinae that separate them from the Halictinae. Pronotal humeri are normally present in Halictinae, but in Rophitinae occur only in *Conanthalictus*, *Sphecodosoma*, and a few species of *Dufourea*. In Halictinae, a fine carina extends diagonally from the humerus across the side of the pronotum (Fig. 10); such a carina is absent in *Xeralictus* (Fig. 9) and all other rophitines except *Conanthalictus* (Fig. 11), in which it is incomplete.

Halictine females possess a fan-like brush of apically curved hairs on the posteroapical corner of the metabasitarsus (Fig. 8). All Rophitinae lack such a brush. Females of *Xeralictus* and some *Dufourea* have a long, spatuliform posteroapical process (Fig.

6), and other species of *Dufourea* (Fig. 5) and all *Micralictoides* (Fig. 7) have the posteroapical corner produced.

The prepygidial fimbria is divided in Halictinae but not in Rophitinae (partially divided in some *Dufourea* and in *Xeralictus*). The pygidial plate in halictine females is broad, flat, and with the apical margin convex. In contrast, the rophitine pygidial plate is narrow, there is a sharply elevated secondary plate, and the apex is acute.

Metasomal structures of male rophitines are markedly different from those of halictine males. Within the Halictinae, the distal margins of the exposed sterna are generally simple, either transverse or weakly concave. Projections from either the discs or distal margins are common among male Rophitinae but rare in Halictinae. Sternum 7 of rophitine males has one or (rarely) two pairs of distal lobes (apparently lacking in the Chilean genus *Penapis*), and sternum 8 possesses a single, elongate apical process. In the Halictinae, sterna 7 and 8 are short and transverse, without processes.

The genital capsule of Halictinae is characterized by short, broad gonocoxites, gonostyli, penis valves, and volsellae; one or more of these may be contorted into bizarre shapes. In the Rophitinae, these structures are usually elongate and slender (somewhat broadened in *Protodufourea* and *Sphecodosoma*). The genital foramen of Halictinae is very large, is often broader than long, and occupies most of the ventral surface of the gonobase. The genital foramen is longer than broad in Rophitinae, except in *Conanthalictus*, in which it is about as broad as long.

The *Xeralictus* larva in most respects is a typical rophitine and will key to that subfamily in the key by McGinley (1981); the mature larva is described in detail below.

Because *Xeralictus* shares such a wide array of characteristics with the Rophitinae, and so few with the Halictinae, it seems inarguable that it should be included within that subfamily rather than the Halictinae. It should be noted, for the sake of completeness, that the characteristics by which the Rophitinae are separable from the Halictinae will mostly serve to separate them also from the other halictid subfamily, the Nomiinae. The only major feature shared between the Rophitinae and the Nomiinae is the lack of a completely divided prepygidial fimbria in the female.

The Halictinae and Nomiinae form a homogeneous assemblage with a great many shared features, including a general tendency in the females to be polylectic. This agrees well with the opinion expressed by Torchio *et al.* (1967) based on comparative biological data. By contrast, the Rophitinae differ strikingly in many morphological characters, as both adults and larvae, and biologically, including a tendency toward oligolecty, from these two subfamilies. We believe that the inclusion of the Rophitinae within the family Halictidae should be reevaluated, but that problem is beyond the scope of the present study.

Genus *Xeralictus* Cockerell

Xeralictus Cockerell, 1927:41. Type species: *Xeralictus timberlakei* Cockerell, 1927; monobasic and original designation.

DIAGNOSIS

Moderate-sized to large Rophitinae with blackish integument (metasoma may be dull reddish), sparse pilosity, three submarginal cells in forewing, long basal face of propodeum, and mesosoma subpolished to polished between distinct, well-separated punctures; male inner eye margins moderately divergent below, clypeus about 2.3–3.1 times as broad as long, and pygidial plate absent.

DESCRIPTION

Moderate-sized to large, total length more than 7.5 mm; integument non-metallic, blackish, except metasoma may be dull reddish in female, generally smooth and shiny between distinct punctures; posterior margins of metasomal terga broadly depressed, depressed bands with sparse, fine piligerous punctures; marginal cell of forewing long, distance from apex of pterostigma to apex of marginal cell distinctly longer than distance from marginal cell to wing tip; three submarginal cells present, middle cell much shorter than first or third and receiving first recurrent vein near its apex; first transverse cubital vein interstitial with basal vein.

Pilosity generally sparse on head and body except hairs long, moderately dense and concealing integument on gena, side of propodeum, and outer side of metatibia and tarsi, and except for apical fimbria of metasomal tergum 6 and all of tergum 7 of male; female with long, curled hairs along lower margin of mandible, hairs of lower genal area long and curled, those of side of propodeum short and not concealing surface, pro- and mesotibiae and tarsi densely pubescent, scopal hairs of metatibia and metabasitarsus long, dense, and reclinate, metasomal terga 3 and 4 with short basal bands of short, white hairs. Tergum 5 covered by compact mass of brownish hairs that is divided in middle, partially exposing pygidial plate on following segment.

MALE: Head (Fig. 1) distinctly broader than long; antennal sockets slightly below midlength of head; inner eye margins moderately divergent below, LID about 1.3 times UID. Vertexal margin nearly straight in frontal view and strongly elevated above top of eye; anterior ocellus below line drawn between tops of eyes. Clypeus at least twice as broad as long, longer than labrum; separated from antennal socket by about a socket diameter; apical margin broadly convex between distinct sublateral angles that are nearer lateral angles than each other. Labrum more than twice as broad as long; median tubercle narrow and high at base, lower and broader distally, its margins sharply carinate, especially basad; laterobasal portion of labrum concave and polished.

Frontal suture weak or absent. In profile, greatest width of gena distinctly greater than width of eye; thick, slightly curved process present near base of

mandible (Fig. 2). Hypostomal carina sharply elevated at base and abruptly reduced at about one-third distance from base, angle mesad of mandible base prominent and acute; hypostoma about twice as broad as base of mandible.

Mandible (Fig. 1) about 2.5 times as long as basal width, apical tooth stout; preapical tooth at right angle to long axis of mandible, dorsal margin between it and subbasal angle long, with concave shiny facets basad and distad of subbasal angle, distal facet long and tapering toward preapical tooth; ventral margin with prominent, convex flange beginning at about midlength and tapering toward apex.

Ocellar triangle broad; OOD greater than IOD in frontal view, OVD equals or exceeds OD.

Antennal scape more than three times as long as broad, about as long as following three segments combined, extending to level of anterior ocellus; first flagellar segment longer than broad and longer than nearly quadrate second segment; flagellar segments 3–10 longer than broad, somewhat flattened beneath, without hair tufts or obvious sensory structures.

Pronotal collar narrow and high, deeply depressed in middle; pronotal side without humeral angles, ridges, or carinae. Mesoscutum about as long as wide. Dorsal face of propodeum about twice as long as metanotum and about one-half as long as posterior face when viewed in profile.

Metasomal T7 densely pilose, without pygidial plate. Sterna 2 and 3 translucent, shiny, posterior margin slightly projecting across middle one-third; S4 (Figs. 22, 23) with large, flat, shiny apical process; S5 (Figs. 24, 27) with high, curved, sublateral lamella-like ridges and large, apically broadened median process; S6 (Figs. 25, 28) short, with two slender, curved, submedian apical processes; S7 (Figs. 26, 29) bifurcate at apex; S8 (Figs. 30, 32) with basal apodeme broad, apical process long, narrow, and pilose. Genitalia (Figs. 34–37): genital foramen longer than broad; capsule elongate; volsella prominent.

FEMALE: Similar to male except usual sexual differences and the following. Head (Fig. 3) slightly broader than long or about as long as broad. Clypeus about twice as broad as long; sublateral angles more prominent than in male and margin between them more strongly convex. Labral tubercle a simple median convexity, neither prominent in profile nor with sharp margins. Preapical tooth of mandible broadly rounded; subbasal angle absent; ventral convexity absent. Greatest width of gena only slightly greater than that of eye; no ventral process near base of mandible. Hypostomal carina nearly uniform in height throughout its length; hypostoma only slightly wider than base of mandible.

Base of stipes with dense brush of long, simple hairs; galea of maxilla short and broad, apex narrowly rounded and extending only slightly beyond third segment of maxillary palpus; maxillary palpus six-segmented, segments elongate and cylindrical, last segment reaching tip of extended glossa; labial

palpus four-segmented, segments elongate and cylindrical, basal segment distinctly curved at base, last segment extending slightly beyond apex of segment 4 of maxillary palpus.

Ocellar triangle broad and ocelli below level of tops of eyes in frontal view; OOD slightly greater than IOD; OVD about twice as great as OD.

Antennal scape about as long as following four segments combined; first flagellar segment distinctly longer than broad and longer than second; segments 2–10 broader than long.

Mesotibial spur with seven to nine large, coarse teeth; outer metatibial spur with three to six low, oblique, coarse, well-separated teeth; basitibial plate large, marginate, flat, densely pubescent; metabasitarsus with posteroapical, translucent spatuliform process (Fig. 6). Scopa (Fig. 19) copious, with many long, distally curled hairs.

Prepygidial fimbria of metasomal tergum 5 partially divided posteriorly; pygidial plate largely concealed by pilosity of tergum 5; metasomal sterna unmodified.

Features of pilosity, limited to female, that are presumably associated with pollen gathering and transport, in addition to the metatibial scopa, include the brush of long, curled hairs on the lower gena; the long, simple, apically curled hairs of the probasitarsus; the marginal fringes of long hairs on metasomal sterna 2–4.

LARVA: The following description is comparative to that of the mature larva of *Sphecodosoma dicksoni* (Timberlake) in Rozen (in prep.). See that paper for references to descriptions of larvae of taxa named below.

Diagnosis: Mature larvae of the Rophitinae can be recognized by the following combination of characters: dorsolateral body tubercles conical (i.e., not transverse), present on most body segments; those of pronotum noticeably smaller than those of following segments; labiomaxillary region more or less produced; salivary lips projecting, transverse; abdominal segment IX strongly produced medially. Because those features by which known mature larvae of Rophitinae may be distinguished from one another are given in Rozen (in prep.), they are not repeated here.

Head (Figs. 12, 15): Integument of capsule with scattered sensilla that are small and not obviously setiform; integument somewhat pigmented; internal ridges and mandibular apices more darkly pigmented.

Head (Fig. 13) small compared to remainder of body; head capsule distinctly wider than length measured from top of vertex to lower clypeal margin in frontal view. Tentorium well developed, possessing well-developed dorsal arms; anterior tentorial pits normal in position, not immediately adjacent to anterior mandibular articulations; posterior tentorial pits in normal position at junction of posterior margin of head and hypostomal ridges; posterior thickening of head capsule moderately developed, not curving forward medially as seen in

dorsal view; posterior margin of head in normal position; median longitudinal thickening of capsule absent except at summit; hypostomal ridge well developed, arching upward in middle, without ramus, of moderate length, forming approximately 90° angle with posterior margin as seen in lateral view (Fig. 15); pleurostomal ridge well developed; epistomal ridge moderately developed, extending part way between anterior tentorial pits; epistomal depression not pronounced (see Remarks). Parietal bands evident. Antennal prominence moderately weak (Fig. 15) (see Remarks); antennal disc moderately small (Fig. 12); antennal papilla small (Fig. 12), bearing three sensilla. Vertex evenly rounded in side view (Fig. 15), without unusual projections; clypeus moderately wide, of normal length (i.e., not short so that clypeolabral suture almost in line with anterior mandibular articulations as seen in frontal view, as in *Sphecodosoma dicksoni*, *Dufourea mulieri* (Cockerell), and *D. novaeangliae* (Robertson)); frontoclypeal area in lateral view (Fig. 15) projecting somewhat beyond labrum (see Remarks). Labrum in profile not projecting beyond clypeus; labral sclerite not evident; labral tubercles virtually absent (Figs. 12, 15); epipharyngeal surface spiculate.

Mandible (Figs. 16–18) robust at base, tapering to simple apex; dorsal surface with a few small, sharp-pointed spicules; outer surface with large, conspicuous tubercle; dorsal adoral surface with numerous large, sharp-pointed teeth near cusp; dorsal apical edge dentate; ventral apical edge with small teeth; apical concavity weakly developed, apparently represented by shallow groove extending from apex along ventral surface, this area nonspiculate. Labiomaxillary region (Fig. 15) only somewhat produced, not as much as in *Sphecodosoma* and *Dufourea* (see Remarks). Maxillary apex not produced mesally; sclerotized cardo and stipes pigmented, clearly visible; articulating arm of stipital sclerite quite evident because of pigmentation; galea not evident; maxillary palpus moderately elongate, longer than basal diameter. Labium divided into prementum and postmentum but not as strongly so as in *Sphecodosoma* and *Dufourea*; premental sclerite unpigmented; labial palpus slightly smaller than maxillary palpus. Salivary lips developed, a projecting, narrow, transverse slit. Hypopharynx a bulging, non-bilobed, spicule-bearing surface; hypopharyngeal groove extending between apices of articulating arms of stipital sclerites, separating hypopharynx from dorsal labial surface.

Body: Integument pigmented, rigid at least on postdefecating larva, without setae or setiform sensilla; sides of pronotum, dorsal and ventral areas of most body segments spiculate; dorsolateral tubercles and apex of abdominal segment X microscopically irregularly roughened compared to rather smooth integument elsewhere. Body form (Fig. 13) moderately robust, not greatly elongate; intersegmental lines well incised; intrasegmental lines apparently evident on some abdominal segments as lines extending down from front of dorsolateral

tubercles; paired dorsolateral body tubercles conspicuous on meso- and metathorax, and abdominal segments I–VIII, all but absent on IX, comparatively reduced in size on prothorax, and absent on abdominal segment X; dorsolateral body tubercles conical rather than transverse, many appearing truncated, possibly as result of small brood cell (see Remarks); other tubercles absent; venter of abdominal segment IX strongly produced medially; segment X attached dorsally to IX, its apex without ridges or other modifications, but flattened (see Remarks); anus presumably apical on X as seen in lateral view (Fig. 13). Spiracles (Figs. 13, 14) moderately small, not on tubercles, subequal in size, without sclerites; peritreme present but narrow; atrium projecting above body wall, with rim, globose; atrial wall smooth; primary tracheal opening with collar; subatrium normally short, with about nine chambers. Male sex characters unknown; female with two darkly pigmented cuticular scars on venter of each of abdominal segments VII–IX.

Material Studied: 1 postdefecating larva, Big Morongo Canyon, Riverside Co., California, April 1967 (G.I. Stage; AMNH).

Remarks: This larva was examined by Rozen, who has been studying the rophitine larvae, and most of the preceding description is drawn directly from his remarks. Additionally, he noted that the specimen revealed certain features that appear to be the direct result of its having been enclosed in a confining brood cell during development, as mentioned in the following Biology section. The apparent resultant modifications include the following: front of head and perhaps antennal prominences somewhat flattened; labrum somewhat recessed under flattened clypeus; many dorsolateral body tubercles apically truncate (Fig. 13); abdominal segment X short, apically flattened. While some of these features may actually be innate to this species and not the result of confined quarters during growth, there is little doubt that the truncate dorsolateral tubercles, short abdominal segment X, and flattened face would not occur in a larva recovered from a larger cell. We do not know if all cells of this species are so confining.

We cannot state with certainty whether or not *Xeralictus* spins a pupal cocoon, even though the larva described above is a postdefecation specimen; in other rophitines, feces and cocoon fabric are closely connected. If this bee does not spin a cocoon, it is the first known rophitine to exhibit this trait. Such a possibility is supported by some anatomical features of the larva: the more rigid, pigmented body integument, the less produced labiomaxillary region, and the less distinct division of the labium into prementum and postmentum when compared to other known rophitines. On the other hand, the strongly projecting (but narrow) salivary lips suggest cocoon spinning. If this species produces no cocoon, this habit must be recently evolved. Larvae of lineages that abandon cocoon spinning quickly lose projecting salivary lips, as ev-

idenced in the anthophorid genus *Exomalopsis*, where some species spin cocoons and have well-developed salivary lips and projecting labiomaxillary regions, whereas other species have lost cocoon-spinning features (McGinley, 1987).

BIOLOGY

Little is known of the nesting biology of *Xeralictus*; only a single nest of *X. timberlakei* has been found. That nest was located in Big Morongo Canyon in the Little San Bernardino Mountains, Riverside County, California, and was excavated by GIS. The site was on a talus-covered slope of about 45° overlying a layer of decomposed granite and fine clay soil. The nest entrance was in an abandoned vertebrate burrow. The female *Xeralictus* was seen to fly directly into the burrow, flying slowly until out of sight.

When excavated, the tunnel was irregular and meandered along cracks and around stones in the soil, vertical at some points, horizontal at others. The tunnel was circular in cross-section, not filled with soil and lined with fine soil, with no indication of any lining secretion or wax. A total of four cells was found, two with mature larvae, one with fragments of an adult female, and one, the terminal cell, empty. No measurements are available for these cells, which were stout and abruptly truncate-ovoid in shape; the cell closures were flat. Although no waxy lining was present (surface dull), the fine soil lining of the interior of the cells was apparently treated in some manner since the cells were removed intact. The larval meconium was evenly deposited along the bottom of the cell. Mature larvae fit snugly in the cells, with only the tubercles in contact with the cell walls.

The preceding information was reconstructed from fragmentary notes by GIS. To this may be added that females are often seen flying about in “searching” patterns on talus slopes. They explore shadowed areas, cracks, and holes.

Females of both species of *Xeralictus* are oligoleges on flowers of some *Mentzelia* species in the Bicuspidaria Section (Darlington, 1934; Thompson and Roberts, 1974) and are part of a complex of bees associated with these *Mentzelia* and the morphologically convergent *Eucnide urens*, the sole member of the section *Mentzelopsis* (Thompson and Ernst, 1967) of *Eucnide*; both are genera within the Loasaceae. *Mohavea confertiflora* (Scrophulariaceae) probably should be included here also, but it has not been studied as intensively as the Loasaceae species. Four closely related allopatric species of *Mentzelia* are involved: *M. hirsutissima*, *M. involucrata*, *M. tricuspidis*, and *M. tridentata*. These species have exerted stigmas that tend to preclude pollination except by bees of moderate size that must orient in a specific manner when entering the blossom; the blossom of *Eucnide urens* is morphologically parallel and must be entered in the

same fashion. Another species in the Bicuspidaria Section is *M. reflexa*; it (and some populations of each of the other three species) has a short stigma that terminates on the same level as the anthers and may be pollinated by nearly any visiting insects and is also capable of self-pollination.

In addition to the two *Xeralictus* species treated here, the pollinator guild includes two *Hesperapis* species (Melittidae) belonging to the subgenus *Xeralictoides*, *H. laticeps* Crawford, 1917, and an undescribed species (Stage and Snelling, in prep.), and one species of *Megandrena* (Andrenidae), *M. mentzeliae* Zavortink, 1972. The floral visiting behavior of *M. mentzeliae* has been presented in some detail by Zavortink (1972), who observed this species at its type locality in Clark County, Nevada. Other bees, belonging to the genera *Perdita* (Andrenidae) and *Lasioglossum* (*Dialictus*) (Halictidae), are commonly encountered on these plants but appear to be scavengers, even though such species as *P. koebelei* Timberlake appear to be oligoleges on these plants.

At his Clark County site, Zavortink (1972) found three members of this pollinator guild visiting *Mentzelia tricuspis*: *Megandrena mentzeliae*, *Xeralictus bicuspidariae*, and *Hesperapis* new species. Zavortink noted that the *Megandrena* is more active in the forenoon than the other two species and tended to visit freshly opened flowers, and that the other two species visited older blossoms in which the mass of stamens had already been loosened due to aging. He observed,

When the stamens are tightly appressed to the style, as they are in the fresh flowers visited by *Megandrena mentzeliae*, the *Xeralictus* and *Hesperapis* are not able to force their way into the pollen chamber. They are, in fact, only rarely seen in such flowers. If, as is apparently the case, the stigma of *Mentzelia tricuspis* is receptive when the flower first opens, then pollination has occurred before the flower is visited by *Xeralictus* and *Hesperapis*, and the latter do little more than collect residual pollen.

While this may be true of the populations at that locality, it certainly is not true in other areas where both *Xeralictus* and *Hesperapis* utilize *M. tricuspis* and other species of *Mentzelia* in the absence of *Megandrena*.

Xeralictus females enter *Mentzelia* blossoms in a characteristic fashion. The females plunge directly into a blossom and, even when the stamens are still tightly compressed together in a newly opened blossom, immediately force entry. If the bee is a female collecting pollen, the tip of the metasoma is hooked over the style and the bee usually rotates around the interior of the blossom, pivoting on the style. While the pollen is being collected, a clearly audible scratching sound may be heard. Presumably this is the result of the bee raking pollen from the pollen chamber or from the anthers.

The female periodically backs out of the mass of stamens and falls sideways within the blossom; in this position she then removes pollen from the pollen brush on the underside of the head and from

the forelegs and transfers it to the metatibial scopa. She may then burrow back into the blossom to gather more pollen or, less often, fly to another.

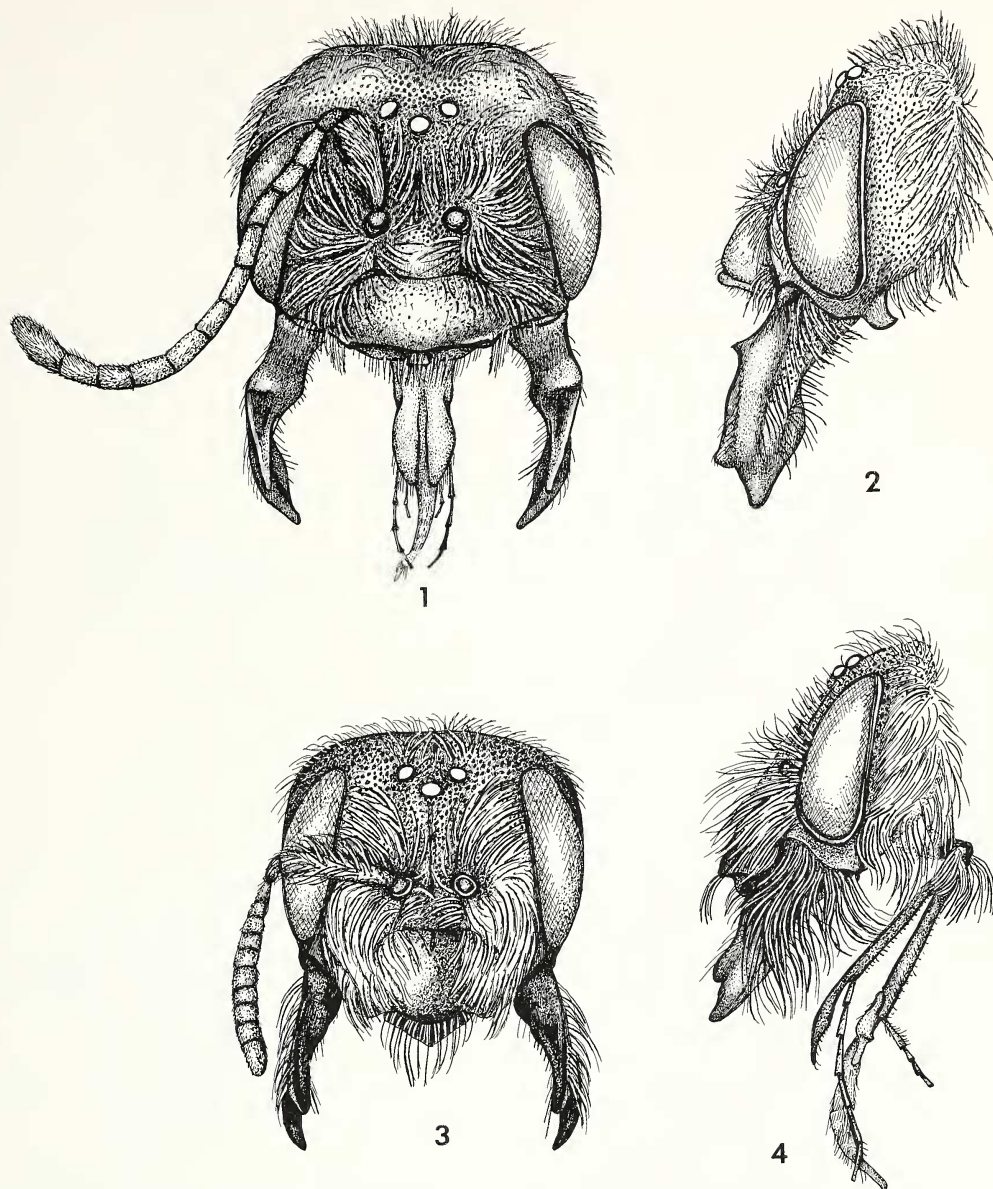
One puzzling aspect of the biology of these bees is whether or not floral nectar is used in provisioning the nest cells. The blossoms of the *Mentzelia* apparently do not produce nectar, although the authors are in disagreement on this matter: Stage maintains that they do produce nectar, while Snelling has the opposite view. The latter view is also that of H.J. Thompson and T.J. Zavortink (pers. comm.), both of whom have studied these flowers in the field.

In areas where *Megandrena mentzeliae* is absent, *Hesperapis* and *Xeralictus* enter freshly opened blossoms, although *Hesperapis*, the smallest bees in this pollinator guild, do so with some difficulty. Once the stamens are loosened, the large amount of pollen produced by the anthers is then available for exploitation by true scavenger bees. These are mostly various species of *Perdita*, especially *P. koebelei* Timberlake (1964), but including also *Ancylandrena timberlakei* Zavortink (1974), *Agapostemon* spp., and *Lasioglossum* (*Dialictus*) spp. Individuals of *Perdita* species are often present in great numbers and may form veritable "clouds" around the *Mentzelia* plants. Females of *P. koebelei* have been observed attempting to "steal" pollen from the scopae of *Xeralictus* females.

Mating occurs on the flowers. Males apparently are territorial, at least to some degree, but further study of this must be conducted. They usually perch within blossoms and await the arrival of foraging females. Within the blossoms males assume a distinctive "guarding" posture (as in Fig. 38, on a blossom of *Mohavea confertiflora*), possibly to intimidate other males. Any female that enters the blossom is immediately grappled and a mating attempt ensues. If the mating attempt is successful, the bees remain coupled for up to about 30 seconds, commonly lying on their sides within the blossom. After separation the female either resumes her foraging activity on that flower or moves to another. The male, after mating, flies off to make a "round" of his territory. Such males may pounce on females within blossoms or attack males in other blossoms. Such attacks result in furious buzzing and energetic combat. Often the combatants fall from the blossom; the combat terminates as soon as the bees reach the ground and both return to their routines.

The distribution of the pollinator guild associated with Section Bicuspidaria is complex but, in general, at any given site there are only two of these bees present. In general, also, of the two species that may be present, there is one in which the female has a red metasoma and one in which the female has a black metasoma. Additionally, two species of the same genus are seldom present at the same site.

A few localities do not fit this pattern. At Phoenix (Arizona) and at Isla Angel de la Guarda (Baja California), only a single species has been found: a dark



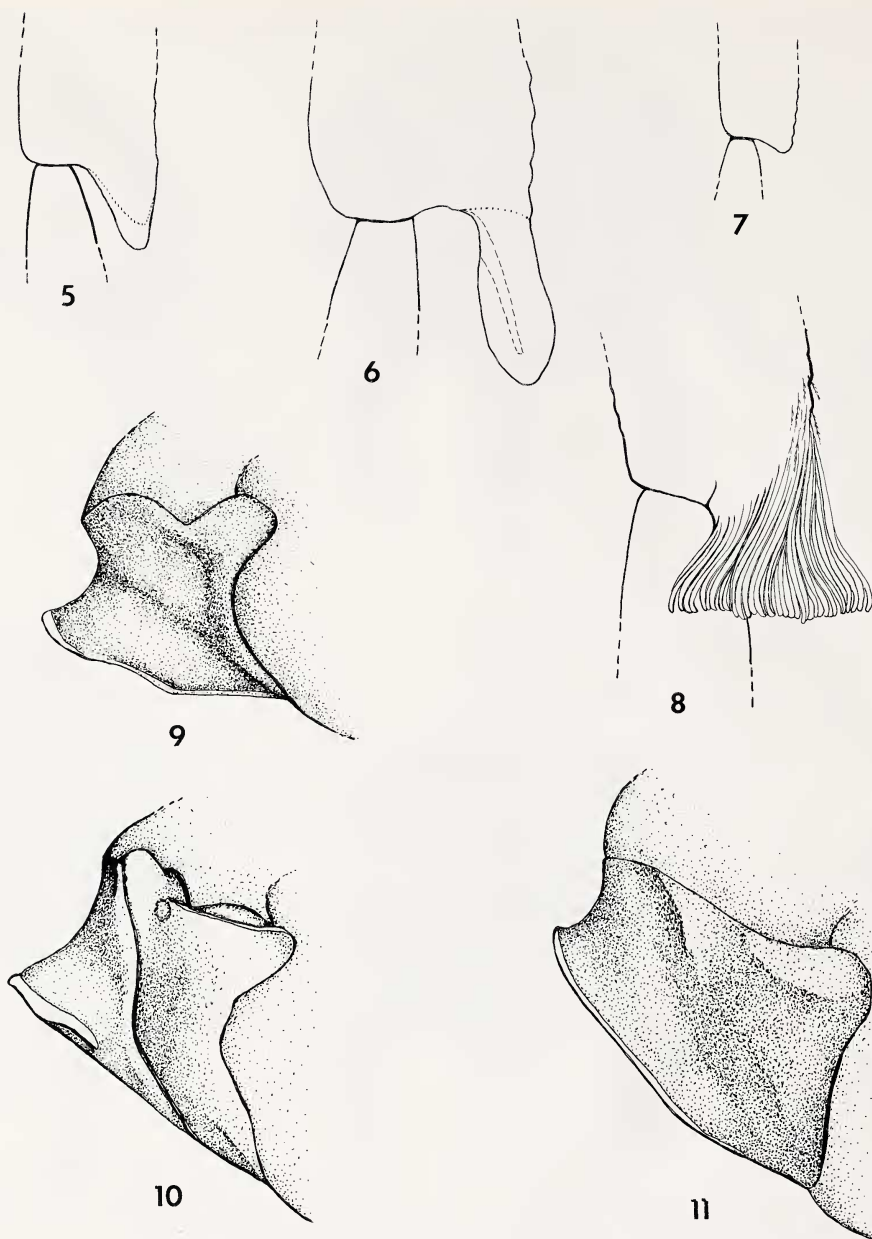
Figures 1–4. *Xeralictus timberlakei*, frontal and lateral views of male (1, 2) and female (3, 4) head. Figures by Ruth Ann DeNicola.

phase of *X. bicuspidariae*. Zavortink's Clark County (Nevada) site has three species, one of each genus; this site is further exceptional in that females of all three species have red metasomata.

Other localities with atypical populations include northern Mohave County (Arizona): Willow Beach; 9.6 and 13.7 mi SE Hoover Dam; Kingman Wash; Lone Mountain Road. At each site, *X. bicuspidariae* and *Hesperapis* new species are sympatric. Although most populations of the *Hesperapis* have females with red metasomata, many at these sites have very dark reddish, almost brown, metasomata and others are normal. At these sites, the *Hesper-*

apis species forage almost exclusively at *Eucnide urens*, and *X. bicuspidariae* is found only on *M. tricuspis*. At several dozen other sites, we have found this species of *Hesperapis* to be an oligolege of *Mentzelia*, and it is only at these four sites that females with dark metasomata are found.

While there are no known sites where the two species of *Hesperapis* occur together, two California localities are known where the two *Xeralictus* species are sympatric: El Paso Mountains (Kern County) and the Chuckwalla Mountains (Riverside County). At both locations the two species forage on *M. involucrata* in about equal numbers.

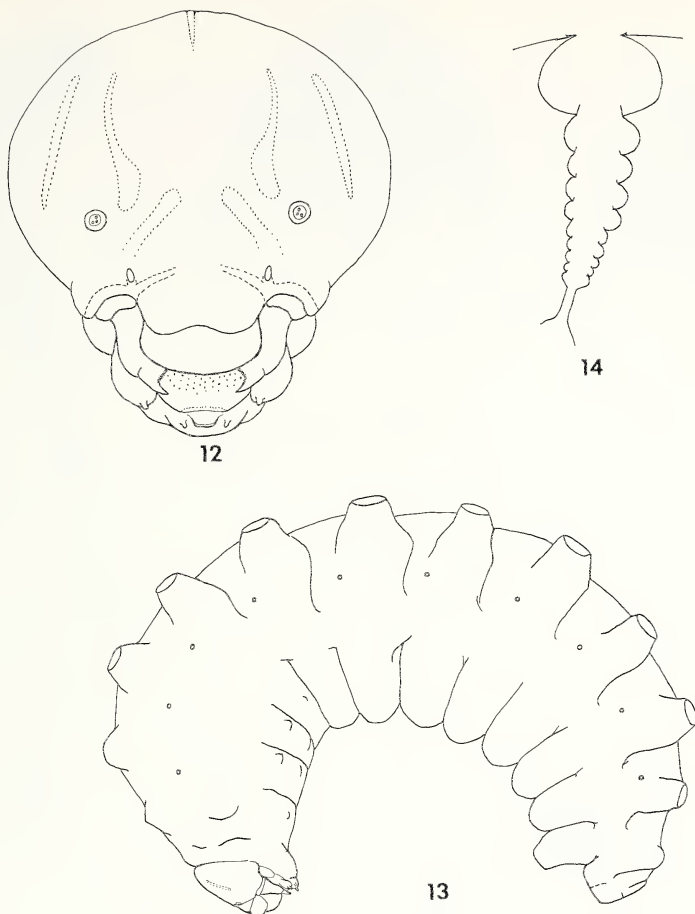


Figures 5-11. 5-8. Apex of metatibia of female of *Dufourea virgata* (5), *Xeralictus timberlakei* (6), *Micralictoides ruficaudus* (7), and *Lasioglossum fuscipenne* (8). 9-11. Lateral view of pronotum of *X. timberlakei* (9), *Halictus ligatus* (10), and *Conanthalictus bakeri* (11). Figures by Ruth Ann DeNicola.

Of the two species of *Xeralictus*, *X. timberlakei* has the more restricted distribution, and its range is primarily confined to the western Colorado and Mojave Deserts of southern California. Within this area it appears to be an oligolege of *M. involucrata*, the most widely distributed member of the Bicuspidaria Section of *Mentzelia*. Why *X. timberlakei* should have a distribution that is largely limited to the western portion of the range of its host plant is puzzling, but presumably some factor of competition is involved.

More widely distributed is *X. bicuspidariae*, the range of which encompasses much of that of *M. involucrata* but includes also *M. tricuspis*, *M. tridentata*, and *M. hirsutissima*. Although *X. bicuspidariae* is most often associated with *M. involucrata*, each of the other species is also utilized as a pollen source.

The distribution of various members of the *Mentzelia* Bicuspidaria Section exceeds that presently known for *Xeralictus*. Whether or not these bees are truly absent from these areas remains to



Figures 12-14. *Xeralictus timberlakei*, mature larva. 12. Frontal view of head. 13. Lateral view of head and body. 14. Spiracle. Figures by Ruth Ann DeNicola.

be determined. Further collecting is obviously necessary, especially in Baja California.

KEY TO SPECIES OF XERALICTUS

- 1 Male, antenna 13-segmented and metasomal sterna 4 and 5 with prominent median process on apical margins 2
- Female, antenna 12-segmented and metasomal sterna without median processes 3
- 2(1) Median process of S4 distinctly angulate on each side (Fig. 22); process of S5 with sharp apicolateral corner (Fig. 24); large species, head width at least 2.75 mm, usually more than 3.00 mm *timberlakei* Cockerell
- Median process of S4 not angulate on each side (Fig. 23); process of S5 with rounded apicolateral corners (Fig. 27); smaller species, head width less than 2.70 mm *bicuspidariae* new species
- 3(1) Metasoma dark brown, tergal margins often broadly dusky ferruginous; large species,

head width at least 2.50 mm and usually over 2.70 mm; head a little broader than long *timberlakei* Cockerell

- Metasoma ferruginous, tergum 2 usually with dark brown spot on each side (rarely entire metasoma dusky ferruginous); smaller species, head width no more than 2.60 mm and usually less than 2.50 mm; head slightly longer than broad *bicuspidariae* new species

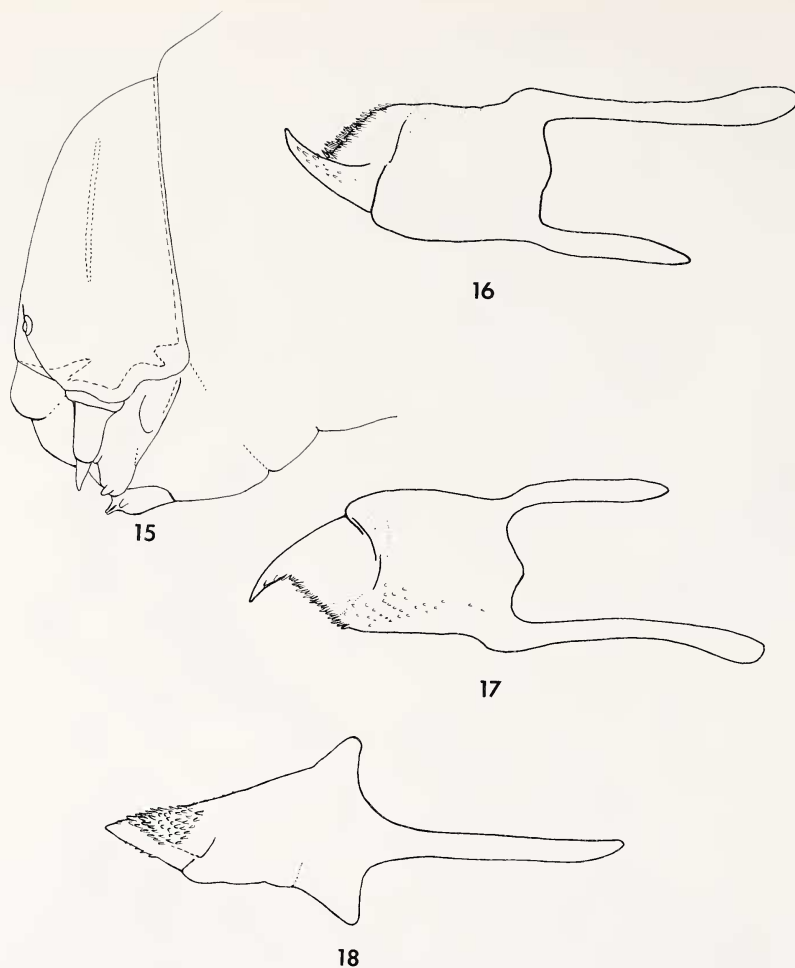
Xeralictus timberlakei Cockerell

Figures 1-4, 6, 9, 19, 20, 22, 24-26, 30, 31, 35, 37, 38

Xeralictus timberlakei Cockerell, 1927:42; ♂.

DIAGNOSIS

Male. Median process of metasomal tergum 4 angulate on each side and process of sternum 5 with sharp apicolateral corner; head width at least 2.75 mm and usually over 3.00 mm. *Female*. Metasomal terga dark brown across discs; head width



Figures 15-18. *Xeralictus timberlakei*, mature larva. 15. Lateral view of head. 16. Right mandible, ventral view. 17. Same, dorsal view. 18. Same, mesial view. Figures by Ruth Ann DeNicola.

at least 2.50 mm, usually over 2.70 mm, and a little greater than head length.

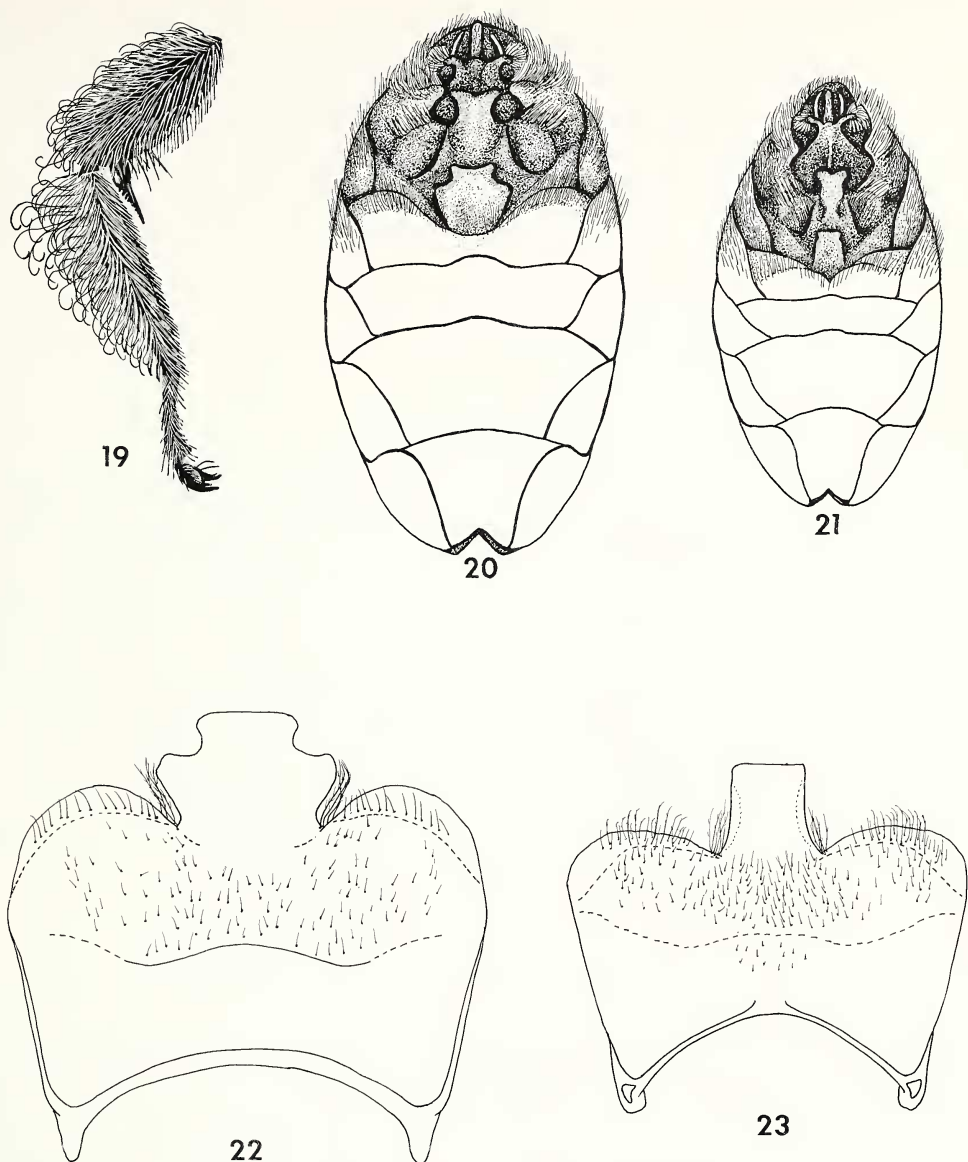
DESCRIPTION

Male, measurements (mm): HW 2.81-3.60; FL 1.9-2.2; wing length (WL) 7.3-8.7; total length (TL) 12.0-13.6.

Head about 1.2 times broader than long. Inner eye margins moderately divergent below, LID about 1.2 times UID. IOD about 2.5 times OD; OOD about 2.7 times OD. Clypeus moderately shiny between scattered fine to moderate punctures; middle of supraclypeal area moderately shiny and impunctate, but laterally with subcontiguous punctures that become sparser laterad; lower paraocular area shiny between scattered fine punctures that become moderate to coarse adjacent to antennal sockets; punctures of vertex moderate, variably spaced from subcontiguous behind ocelli to close or sparse laterad and near vertexal margin. Gena shiny between moderate subcontiguous to dense punctures.

Mesoscutum shiny, punctures fine to moderate, subcontiguous at side, becoming sparse in center; scutellum shiny, very weakly tessellate, with very widely scattered fine punctures over most of disc, some subcontiguous coarse punctures at extreme side; metanotum slightly duller, with sparse moderate punctures in middle and subcontiguous coarse punctures laterad. Mesepisternum slightly shiny and roughened between coarse subcontiguous or dense punctures; metepisternum dull, finely, contiguously rugosopunctate. Basal area of propodeum slightly shiny and distinctly roughened, most of basal area with fine, longitudinal striae; side slightly shiny and distinctly roughened, most of basal area with fine, longitudinal striae; side slightly shiny and distinctly roughened between minute subcontiguous to dense punctures. Outer metatibial spur with four to five coarse, suberect teeth.

Metasomal terga moderately shiny and finely roughened between fine, dense to subcontiguous punctures; apical margins of segments 1-5 broadly depressed with finer, more obscure punctures than



Figures 19–23. *Xeralictus timberlakei*. 19. Scopa of female. 20, 21. Ventral view of male metasoma of *X. timberlakei* (20) and *X. bicuspidariae* (21). 22, 23. Male S4 of *X. timberlakei* (22) and *X. bicuspidariae* (23). Figures 19–21 by Ruth Ann DeNicola.

on discs. Sterna 2 and 3 shinier, sparsely and finely punctate, but with broad apical margins nearly transparent, polished and shiny. Apical process of S4 (Fig. 22) broad and with distinct lateral angle; in ventral view, apicolateral angle of median process of S5 (Fig. 24) narrowly rounded. Process of S8 (Fig. 30) long, evenly narrowed distad to convex apical margin.

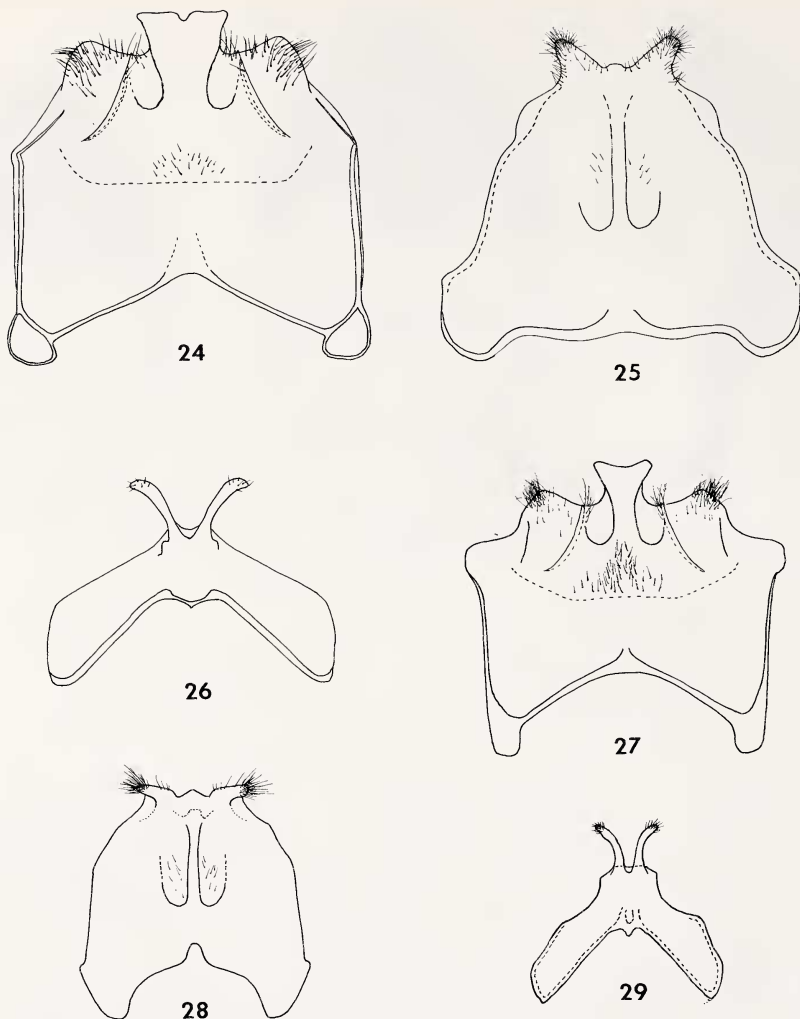
Female, measurements (mm): HW 2.5–3.0; FL 1.9–2.2; WL 6.5–7.6; TL 10.9–12.4.

Head about 1.2 times as long as wide. Inner eye margins weakly divergent below, LID about 1.1 times UID. IOD about 2.06 times OD; OOD about

2.4 times OD; OVD about 1.5 times OD. Clypeus smooth and shiny, punctation as described for male. Remainder of cephalic punctation as in male.

Mesosoma as in male, but mesepisternal punctures less dense and more obscured by roughening of interspaces. Outer metatibial spur with five to six coarse suberect teeth.

Metasoma similar to that of male other than usual sexual differences (six segments, sterna simple, etc.); T6 pygidial plate usually hidden under prepygidial fimbria of T5; discs of S2–S6 transversely roughened, moderately shiny; distal one-half or more of S2 with sparse, coarse, piligerous punctation.



Figures 24–29. *Xeralictus* spp., male metasomal sterna 5, 6, and 7, respectively, of *X. timberlakei* (24–26) and *X. bicuspidariae* (27–29).

tures; S3–S5 each with preapical bands of coarse, piligerous punctures, the discs without definite punctures. Terga dark reddish brown with yellowish hyaline margins.

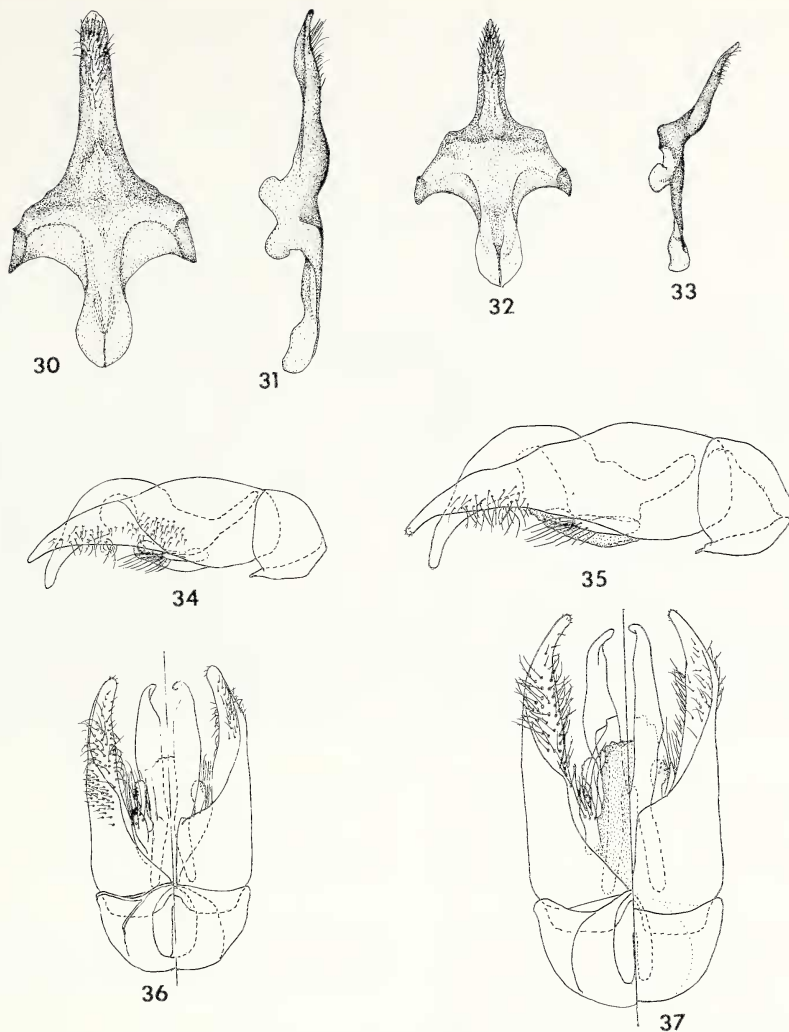
TYPE MATERIAL

The type male is from Salt Creek [San Bernardino Co.], California, 20 Mar. 1927 (P.H. Timberlake), on flowers of [*Nuttallia*] = *Mentzelia involucrata*, and is deposited in the California Academy of Sciences. We have examined the type and it agrees with the current concept of this species.

SPECIMENS EXAMINED

UNITED STATES, California, *Kern Co.*: 2 ♀, Iron Cyn., El Paso Mts., 17 Apr. 1966 (G.I. Stage; GISC), on *Mentzelia involucrata*; 2 ♀, 6 ♂, same locality, 17 Apr. 1962 (C.A. Toschi; GISC), on *M. involucrata*; 1 ♂, E branch

Last Chance Cyn., El Paso Mts., 10 Apr. 1960 (C.A. Toschi; GISC); 2 ♂, Last Chance Cyn., El Paso Mts., 12 Apr. 1964 (R.R. Snelling; LACM), on *M. involucrata*; 4 ♀, 6 ♂, same except 15 Apr. 1964; 2 ♀, 13 ♂, same locality, 6 Apr. 1966 (G.I. Stage; GISC), on *M. involucrata*; 6 ♂, same locality, 6 Apr. 1968 (T.J. Zavortink; TJZC), on *M. involucrata* (5 ♂) and *Malacothrix* (1 ♂); 4 ♂, Red Rock Cyn., El Paso Mts., 12–14 Apr. 1966 (G.S. Daniels; LACM), on *M. involucrata*. *Riverside Co.*: 1 ♂, Beal's Well, 13 Apr. 1949 (P.H. Timberlake; UCR), on *Aster abatus*; 1 ♂, Berdoo Cyn. Rd., 3.9 mi E Dillon Rd., 3 Apr. 1985 (T.J. Zavortink, S.S. Shanks; TJZC), on *M. involucrata*; 3 ♀, 4 ♂, Blythe, Apr. 1941 (G.E. Bohart; BBSL), on *Echinocactus*; 1 ♂, 11 mi S Hwy. 60, Blythe–Niland Rd., 13 Apr. 1949 (R.C. Dickson; UCR), on *M. involucrata*; 4 ♀, 4 ♂, Box Cyn., E of Mecca, 4 Apr. 1937 (P.H. Timberlake; UCR), on *M. involucrata* (4 ♀, 1 ♂) and *Mohavea confertiflora* (1 ♂); 2 ♀, same locality, 24 Mar. 1953 (P.H. Timberlake; UCR), on *M. involucrata*; 1 ♂, 1 mi W Corn Springs Recreation Site, 20 Apr. 1973 (E.M. Fisher; LACM); 76 ♀, 38 ♂, Corn Springs Wash, Chuckwalla Mts., 6–8 mi SSE Desert Center, 22 & 25 Mar. 1970, 11–12 Apr.



Figures 30–37. *Xeralictus* males. Metasoma sternum 8, ventral and lateral views, respectively, of *X. timberlakei* (30, 31) and *X. bicuspidariae* (32, 33). 34, 35. Lateral view of genital capsule of *X. bicuspidariae* (34) and *X. timberlakei* (35). 36, 37. Genital capsule, ventral (left half) and dorsal (right half) views of *X. bicuspidariae* (36) and *X. timberlakei* (37). Figures 30–33 by Ruth Ann DeNicola.

1970 (T.J. Zavortink; TJZC), on *M. involucrata*; 9 ♀♀, 6 ♂♂, same locality, 26 Apr. 1973 (T.J. Zavortink; TJZC), on *M. involucrata*; 2 ♂♂, 3.2 mi W Corn Springs, 1900 ft, 7 Apr. 1994 (R.R. Snelling; LACM), on *M. involucrata*; 1 ♀, 1 ♂, same except 11 Apr. 1994; 1 ♀, Cottonwood Mts., 21 mi E Indio, 18 Mar. 1966 (G.S. Daniels; GISC), on *M. involucrata*; 1 ♂, Cottonwood Springs, 26 Apr. 1949 (J.E. Gillasp; UCB); 4 ♀♀, 99 ♂♂, 6 mi S Cottonwood Springs, 23 Mar. 1966 (J.W. MacSwain, G. Salt, P.D. Hurd; UCB), on *M. involucrata*; 2 ♂♂, 21 mi SW Cottonwood Springs, 9 Apr. 1952 (R.F. Smith; UCB), on *Mentzelia*; 1 ♂, 2 mi W Desert Center, 14 Mar. 1960 (P.H. Raven; UCB), on *M. involucrata*; 1 ♂, Colorado River Aqueduct, 3.6 mi NW Desert Hot Springs, 11 Apr. 1971 (T.J. Zavortink; TJZC), on *M. involucrata*; 20 ♀♀, 8 ♂♂, same locality, 2 Apr. 1985 (T.J. Zavortink, S.S. Shanks; TJZC), on *M. involucrata*; 9 ♀♀, 8 ♂♂, Midway Cyn., 4.5 mi NW Desert Hot Springs, 22 Mar. 1967 (G.I. Stage; USNM), on *M. involucrata*; 10 ♀♀, 12 ♂♂, same locality, 29 Mar.

1967 (R.R. Snelling, G.I. Stage; LACM, USNM), on *M. involucrata* (8 ♀♀, 12 ♂♂) and *Mohavea confertiflora* (2 ♀♀); 5 ♀♀, Whitehouse Cyn., 4.5 mi NW Desert Hot Springs, 20 Mar. 1967 (G.I. Stage; USNM); 1 ♀, 7 ♂♂, canyon between Midway and Whitehouse Cyns., 4.5 mi NW Desert Hot Springs, 13 Mar. 1968 (G.S. Daniels; LACM), on *M. involucrata*; 5 ♀♀, 4 ♂♂, same locality, 6 Apr. 1967 (G.I. Stage; USNM), on *M. involucrata* (5 ♀♀, 2 ♂♂), *Encelia* sp. (1 ♂), and *Malacothrix* sp. (1 ♂); 102 ♀♀, 19 ♂♂, same locality, 18 Apr. 1967 (G.S. Daniels, G.I. Stage; LACM, USNM), on *M. involucrata*; 1 ♂, same locality, 27 Apr. 1967 (G.I. Stage; USNM), on *M. involucrata*; 16 ♀♀, 2 ♂♂, same locality, 1 May 1967 (G.S. Daniels; LACM), on *M. involucrata*; 5 ♀♀, 14 ♂♂, Dry Morongo Wash, 10 Mar. 1968 (1 ♂), 23 Mar. 1968 (6 ♂♂), 24 Mar. 1968 (5 ♀♀), 3 May 1968 (7 ♂♂) (all G.I. Stage; USNM), on *M. involucrata*; 2 ♂♂, Hidden Spring, 2 Mar. 1927 (T. Craig; CAS); 2 ♂♂, Indio, 1 Mar. 1958 (G.H. Nelson; UCD); 1 ♀, 1 ♂, 15 mi E Indio, 18 Mar. 1958 (E.G. Linsley; UCB), on



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Figures 38. *Xeralictus timberlakei*. Male in *Mohavea confertiflora* blossom in typical "guarding" posture. Photo by G.I. Stage.

Mentzelia; 2 ♂♂, same locality, 13 Apr. 1949 (P.H. Timberlake; UCR), on *M. involucrata*; 4 ♂♂, 20 mi E Indio, 26 Apr. 1963 (E.I. Schlinger; UCR), on *M. involucrata*; 60 ♀♀, 63 ♂♂, Little San Bernardino Mts., NW of Desert Hot Springs, 1 mi E Hwy. 62, 3 & 10 May 1969 (T.J. Zavortink; TJJC), on *M. involucrata*; 5 ♀♀, same except 0.75 mi E Hwy. 62, 3 May 1969, on *M. involucrata*; 1 ♂, Mecca, 9 Apr. 1952 (W.H. Lange; UCD); 4 ♀♀, same locality, 18 Feb. 1964 (W.H. Ewart; UCR), on *M. involucrata*; 1 ♂, Morongo Wash, 3 mi S Morongo Valley, 24 Mar. 1972 (T.J. Zavortink; TJJC), on *Datura meteloides*; 1 ♂, Shaver's Well, 16 Feb. 1964 (R.R. Snelling; LACM), on *M. involucrata*; 11 ♀♀, 5 ♂♂, same except 21 Mar. 1988, 2 ♀♀, 4 ♂♂, same except 26 Mar. 1966; 1 ♀, 2 ♂♂, same except 16 Apr. 1966 (G.I. Stage; GISC); 6 ♂♂, 2 mi N Shaver's Well, 9 Apr. 1952 (J.W. MacSwain; UCB), on *Mentzelia*; 1 ♀, 2 ♂♂, 3 mi W Shaver's Well, 1 Mar. 1964 (R.R. Snelling; LACM), on *M. involucrata*; 1 ♀, 1 ♂, same except 28 Mar. 1966; 1 ♀, 5 ♂♂, 4 mi E Shaver's Well, 9 Apr. 1952 (E.G. Linsley; UCB), on *M. involucrata*; 1 ♀, "Edom" (=Thousand Palms), 14 Mar. 1947 (E.G. Linsley; UCB), on *Geraea*; 3 ♀♀, 2 ♂♂, Thousand Palms Cyn., 15 Mar. 1988 (R.R. Snelling; LACM), on *M. involucrata*; 1 ♀, Whitewater, 9 Mar. 1940 (R.M. Bohart; UCD), on *Geraea canescens*; 3 ♀♀, same locality, 25 Mar. 1934 (C.M. Dammers; UCR), on Cactaceae; 2 ♀♀, same locality, 19 Apr. 1934 (P.H. Timberlake; UCR), on *M. involucrata*; 1 ♂, 10 mi E Whitewater, 18 Mar. 1960 (R.M. Bohart; UCD). *San Bernardino Co.*: 1 ♀, 1 ♂, Baker, 15 Mar. 1935 (AMNH); 8 ♀♀, 3 ♂♂, Morongo Pass, 22 Apr. 1937 (P.H. Timberlake; UCR), on *M. involucrata*; 5 ♀♀, 15 ♂♂, Mo-

rongo Valley, 17–21 Apr. 1957 (R.R. Snelling and M.D. Stage; LACM), on *M. involucrata*; 22 ♀♀, 4 ♂♂, 14 mi S Twentynine Palms, 14 Apr. 1935 (P.H. Timberlake; UCR), on *M. involucrata*.

DISCUSSION

Apparently little, if any, of the range of *X. timberlakei* lies east of the Colorado River, and the species appears to be uncommon east of the Chuckwalla Mountains in Riverside County. The principal part of the distribution includes those desert mountain ranges that mark the western edge of the Colorado Desert. This distribution extends north into the Mojave Desert, at least as far as El Paso Mountains in Kern County and the Salt Creek area of San Bernardino County, approximately 20 mi north of Baker; there are no records for the Panamint Range where the host plant is common.

Xeralictus bicuspidariae new species

Figures 21, 23, 27–29, 32–34, 36

DIAGNOSIS

Male. Median process of metasomal sternum 4 simple, without lateral angles; apicolateral angles

of sternum 5 broadly rounded; head width less than 2.70 mm. *Female*. Head width not exceeding 2.60 mm and usually less than 2.50 mm and head less than 1.10 times as long as broad; metasoma ferruginous in populations sympatric with *X. timberlakei*.

DESCRIPTION

Male, measurements (mm): HW 2.10–3.01; FL 1.5–1.9; WL 5.4–6.8; TL 8.0–10.3.

Shape and sculpture of head about as described for *X. timberlakei*, but labral tubercle less elevated; genal process near base of mandible lower and distinctly transverse; hypostomal carina high and lamelliform but not strongly reflexed laterad.

Mesosoma as described for *X. timberlakei* but outer metatibial spur with two, rarely three, fine, strongly reclinate teeth.

Metasoma about as in *X. timberlakei* except: median process of S4 (Fig. 23) without lateral angles; apicolateral angles of process of S5 (Fig. 27) broadly rounded in ventral view; process of S8 acute (Fig. 32).

Female, measurements (mm): HW 2.00–2.51; FL 1.45–1.94; WL 5.1–6.3; TL 7.8–10.9.

Head 1.00–1.05 times as long as broad. Inner eye margins weakly divergent below, LID about 1.05 times UID. IOD about 2.0 times OD; OOD about 2.1 times OD; OVD about 1.4 times OD. Head otherwise about as in female *X. timberlakei*.

Mesosoma as in *X. timberlakei*. Outer metatibial spur with two, or rarely three, coarse suberect teeth near midlength.

Metasoma as in *X. timberlakei* but terga and sterna light reddish, tergum 2 usually with distinct lateral brown spots (see later Discussion).

TYPE MATERIAL

Holotype male: Last Chance Canyon, El Paso Mts., Kern Co., California, 15 Apr. 1964 (R.R. Snelling), on *Mentzelia involucrata*; in LACM. Paratypes (all from El Paso Mts.): 8 ♀♀, 45 ♂♂, same data as holotype; 2 ♀♀, Iron Canyon, 15 Apr. 1964 (R.R. Snelling), on *M. involucrata*; 3 ♀♀, Red Rock Canyon, 12 Apr. 1966 (G.S. Daniels), on *M. involucrata*; 5 ♂♂, Mesquite Canyon, 4 May 1969 (T.J. Zavortink), on *M. involucrata* (2 ♂♂) and *Encelia virginensis* (3 ♂♂); 17 ♀♀, 7 ♂♂, Last Chance Canyon, 6 Apr. 1968 (T.J. Zavortink), on *M. involucrata*. Paratypes in AMNH, BBSL, CAS, LACM, USNM, TJZC, GISC, and UCR.

ADDITIONAL SPECIMENS (not paratypes)

MEXICO, Baja California: 4 ♀♀, 2 ♂♂, Isla Angel de la Guarda, 3, 7, & 25 Mar. 1966 (G.S. Daniels; LACM), on *Mentzelia hirsutissima*; 1 ♂, same locality, 2 Apr. 1973 (H.J. Thompson; TJZC), on *M. hirsutissima*; 3 ♀♀, 5 ♂♂, Isla Mejia, 2 Apr. 1973 (H.J. Thompson; TJZC), on *M. hirsutissima*.

UNITED STATES, Arizona, La Paz Co.³: 4 ♀♀, 1 ♂, 9.1 mi S Quartzsite, 21 Apr. 1966 (P.D. Hurd; UCB), on *M. involucrata*. Maricopa Co.: 1 ♀, 14 mi N Ajo, 20 Mar. 1968 (W.J. Hanson; BBSL), on *Mentzelia* sp.; 1 ♀, 1 ♂, 12 mi SW Gillespie Dam, Gila Bend Mts., 29 Mar. 1969 (T.J. Zavortink; TJZC), on *M. involucrata*; 1 ♀, Phoenix, 21 Apr. 1935 (R.H. Crandall; LACM). Mohave Co.: 9 ♀♀, 4 ♂♂, Hwy. 93, 5.8 mi S Hoover Dam, 25–26 Mar. 1960 (H.J. Thompson; LACM), on *M. tricusps*; 2 ♀♀, 1 ♂, 9.6 mi SE Hoover Dam, 19 Apr. 1967 (G.I. Stage; USNM), on *M. tricusps*; 1 ♀, 1 ♂, 13.7 mi SE Hoover Dam, 20 Apr. 1967 (G.I. Stage; USNM), on *M. tricusps* (♀) and *Eucnide urens* (♂); 2 ♀♀, 1 ♂, Willow Beach, 19 Apr. 1967 (G.I. Stage; USNM), on *M. tricusps*; 8 ♀♀, 3 ♂♂, 2.8 mi E Willow Beach, 9 Apr. 1967 (G.I. Stage, G.S. Daniels; USNM), on *M. tricusps*; 2 ♀♀, 1 ♂, same except 20 Apr. 1967 (G.I. Stage; USNM); 2 ♀♀, 5 ♂♂, same except 2 May 1967 (G.S. Daniels; LACM); 1 ♂, same except 9 May 1967 (G.S. Daniels; LACM). Yavapai Co.: 1 ♀, Hwy. 93, 3.5 mi N Santa Maria River, 26 Mar. 1960 (H.J. Thompson; LACM), on *M. involucrata*. Yuma Co.: 2 ♀♀, 3 ♂♂, Palm Canyon, Kofa Mts., 31 Mar. 1968 (R.M. Bohart; BBSL, UCD); 1 ♂, 29 mi S Quartzsite, 23 Mar. 1970 (T.J. Zavortink; TJZC), on *M. involucrata*; 2 ♀♀, 31 mi S Quartzsite, 23 Mar. 1970 (T.J. Zavortink; TJZC), on *M. involucrata*; 1 ♂, 30 mi S Quartzsite, 29 Mar. 1969 (T.J. Zavortink; TJZC), on *M. involucrata*; 4 ♀♀, 2 ♂♂, same except 12 Apr. 1969, on *M. involucrata* (3 ♀♀, 2 ♂♂) and *Opuntia basilaris* (1 ♀); 6 ♀♀, 6 ♂♂, 32 mi S Quartzsite, 23 Mar. 1968 (R.W. Rust, D.R. Miller, R.L. Brumley; BBSL); 23 ♀♀, 29 ♂♂, 34 mi S Quartzsite, 21 Mar. 1966 (P.D. Hurd, J.W. MacSwain, W.J. Turner; UCB), on *M. involucrata*; 1 ♂, Wellton, 6 Apr. 1935 (A.L. Melander; MCZ).

California, Imperial Co.: 1 ♂, Chocolate Mts., 14 mi NE Glamis, 18 Mar. 1966 (G.S. Daniels; LACM), on *M. involucrata*; 1 ♀, 2 ♂♂, Fossil Cyn., Coyote Mts., 3.5 mi NNW Ocotillo, 26 Apr. 1970 (T.J. Zavortink; TJZC), on *M. involucrata*; 1 ♀, 3 ♂♂, same except 16 Mar. 1973; 1 ♂, Glamis, 8 Apr. 1964 (R.M. Bohart; UCD), on *Mentzelia* sp.; 1 ♀, 1 ♂, 10 mi N Glamis, 30 Mar. 1973 (R.M. Bohart, C. Goodpasture; UCD); 2 ♀♀, 1 ♂, 2 mi N Midway Well turnoff, Hwy. 78, 18 Mar. 1966 (G.S. Daniels; LACM), on *M. involucrata*; 1 ♀, 3 ♂♂, 2 mi SE Mountain Spring, 26 Apr. 1970 (T.J. Zavortink; TJZC), on *M. hirsutissima*; 12 ♀♀, 5 ♂♂, same except 25 Apr. 1973; 2 ♀♀, 15 mi N Ogilby, 10 Mar. 1968 (G.S. Daniels; LACM), on *M. involucrata*; 1 ♀, 1 ♂, Painted Gorge, Coyote Mts., 5 mi N Ocotillo, 26 Apr. 1970 (T.J. Zavortink; TJZC), on *M. involucrata*; 2 ♂♂, same locality, 17 Mar. 1966 (G.S. Daniels; LACM), on *M. involucrata*; 1 ♂, Picacho Rd., 0.7 mi N All-American Canal, 10 Mar. 1968 (G.S. Daniels; LACM), on *M. involucrata*. Inyo Co.: 1 ♂, Surprise Cyn., Panamint Range, 6 Apr. 1961 (R.P. Allen; LACM), on *Eucnide urens*; 2 ♂♂, same locality, 9 May 1958 (A. Menke; UCD). Riverside Co.: 1 ♂, Chuckwalla Mts., 13 mi S Hwy. 60, 13 Apr. 1949 (P.H. Timberlake; UCR), on *M. involucrata*; 2 ♂♂, Corn Springs Wash, Chuckwalla Mts., 6–8 mi SSE Desert Center, 22 Mar. 1970 (T.J. Zavortink; TJZC), on *M. involucrata*; 2 ♀♀, same except 26 Apr. 1973; 1 ♀, 3.2 mi W Corn Springs, 1900 ft, 7 Apr. 1994 (R.R. Snelling; LACM), on *M. involucrata*; 1 ♂, Palm Springs, 27 Mar. 1964 (D.F. Veirs; UCD). San Bernardino Co.: 2 ♂♂, Calico

3. In 1986, Yuma County, Arizona, was divided into two counties, the northern one newly created as La Paz County. The following specimens are, therefore, labeled "Yuma Co." but are from localities now in La Paz County.

Mts., 7.0 mi NE Barstow, 27 Apr. 1973 (T.J. Zavortink; TJZC), on *M. tridentata*; 1 ♂, same except 14.0 mi ENE Barstow; 2 ♀♀, Daggett, 13 Mar. 1968 (G.S. Daniels, LACM), on *M. tricusps* var. *brevicornuta*; 1 ♂, Needles, 3 Apr. 1951 (J.W. MacSwain; UCB); 2 ♀♀, 14 mi S Twentynine Palms, 14 Apr. 1935 (H.L. McKenzie; BBSL), on *M. involucrata*. San Diego Co.: 1 ♀, 1 ♂, Borrego Springs, 30 Mar. 1976 (J.L. Neff; CTMI), on *M. "tricusps"*⁴; 1 ♀, 2 ♂♂, 3 mi SE Borrego Springs, 15–18 Apr. 1976 (P. Lincoln; CTMI), on *M. "tricusps."*⁴

Nevada, Clark Co.: 1 ♂, Boulder Dam, 8 Apr. 1973 (F.D. Parker; BBSL); 1 ♀, Lake Mead, 8 Apr. 1959 (G.E. Bohart; BBSL), on *Encelia farinosa*; 1 ♀, 1 ♂, same locality, 18 Apr. 1949 (BBSL), on *Platypuntia*; 5 ♀♀, 1 ♂, Lake Mead Blvd., 8.9 mi E Hwys. 91 & 93, 14 May 1969 (T.J. Zavortink; TJZC), on *M. tricusps*; 14 ♀♀, 1 ♂, Springs Mts., 5 mi N Las Vegas, 3300 ft, 25–26 May 1969 (R.R. Snelling; LACM), on *M. tricusps*; 446 ♀♀, 95 ♂♂, Spring Mts., 13 mi NW Las Vegas, 3000–3400 ft, various data between 22 Apr. and 25 May, various years (T.J. Zavortink; TJZC), on *M. tricusps*.

ETYMOLOGY

The name of this species reflects the association of *X. bicuspidariae* with the Bicuspidaria Section of the genus *Mentzelia*.

DISCUSSION

This species, like *X. timberlakei*, is very consistent in its morphological features and is superficially very similar to that species. Males of the two species are especially similar, except in size and in the form of the metasomal sterna. The features of the male sterna are so distinctive that an examination of the metasomal venter is sufficient to distinguish between the two species (Figs. 20, 21). Females also differ in size and usually in the color of the metasoma.

The metasomal segments of *X. timberlakei* females are dark brown with translucent yellowish margins. Occasional specimens may have the metasoma light reddish brown. Typically, females of *X. bicuspidariae* have a distinctly red metasoma, usually with a distinct brown spot on each side of T2. This characteristic is especially obvious in those areas where the two species occur together, as well as in areas where the ranges are adjacent. We know of only two California sites where the two species of *Xeralictus* coexist (El Paso Mountains, Kern County; Chuckwalla Mountains, Riverside County), but this may result from inadequate collecting. However, a survey made by one of us (GIS) in 1967 to locate such sites was unfruitful.

The range of *X. bicuspidariae* is more extensive than that of *X. timberlakei*, ranging from above 36°N south to 29°N in Baja California, Mexico. Eastward, *X. bicuspidariae* extends to Clark Coun-

ty, Nevada, and Phoenix, Maricopa County, Arizona. Over most of this range the females are characterized by the distinctly red metasoma. Specimens from the area of the Colorado River may also have red legs, at least in part. The one female from Phoenix, Arizona, and those from Isla Angel de la Guarda are atypical in that the metasoma is dark reddish brown, thus similar to *X. timberlakei*. Some females from Imperial County, California, and Yuma County, Arizona, have the metasoma dark reddish, but not as dark as those from Phoenix and Isla Angel de la Guarda. The two females from San Diego County, California, are also characterized by darker red metasoma, but not as dark as those from Imperial County. Unfortunately, no specimens from the area between the California–Mexico border and Isla Angel de la Guarda are available. Presumably such specimens would continue the trend toward increased metasomal darkening.

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4. Because *Mentzelia tricusps* is not known to occur in San Diego County (Prigge, 1993), we presume that these records are based on misidentification of some other species of *Mentzelia*.

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